

the kitchen as if to remind her of the neglect, and waits quietly, but with a searching eye, during the time the meat is cutting up, until it is fed. It is amusing to observe this bird catch flies: he remains very quiet, as if asleep, and on a fly passing him, it is snapped up in his beak in an instant. The only time I observed any manifestation of anger in him was when the "Mooruks" were introduced into the yard where he was parading about: these rapid, fussy, noisy birds running about his range excited his indignation; for on their coming near him, he slightly elevated the brilliant feathers of the head, the eyes became very brilliant, he ruffled his feathers, and clattered his mandibles as if about to try their sword-like edge upon the intruding "Mooruks;" but his anger subsided with these demonstrations, except an occasional flapping of his powerful wings. One day, however, on one of the "Mooruks" approaching too near him, he seized it with his mandibles by the neck, on which the "Mooruk" ran away and did not appear in any way injured.

### MISCELLANEOUS.

*On the Electrical Organs of Fishes.* By M. SCHULTZE.

THE remarkable researches of M. Bilharz upon the *Malapterurus* commenced a new era in the history of the electrical fishes, by the discovery of the so-called electrical nervous plates. The subsequent works of MM. Kölliker, Ecker, Kupffer, and Keferstein tend to show that these plates exist in all the electrical fishes. M. Schultze now furnishes us with more exact details upon these interesting organs in the Torpedo.

In their microscopic appearance, the prisms of the Torpedo exactly resemble those of the *Gymnotus*; nevertheless the employment of the microscope soon shows some remarkable differences of structure in them. The transverse partitions, which in the *Gymnoti* are formed by fibrous conjunctive tissue, present a far more delicate texture in the Torpedos, being composed of gelatinous conjunctive tissue or mucous tissue (*Schleimgewebe*). This difference, however, is in relation to the great development which the gelatinous conjunctive tissue in general acquires in the organs of the *Plagiostomi*. These partitions are traversed by vessels and nerves, like the more resistant and fibrous walls of the prisms. In the spaces enclosed between the gelatinous transverse septa, other transverse partitions, of far greater solidity, are arranged; these are, properly speaking, the transverse septa hitherto indicated by different authors. A gelatinous partition therefore alternates regularly with a more solid one; and in this latter M. Schultze recognizes an electrical plate.

Hitherto the gelatinous partitions (the true septa, according to M. Schultze) were regarded as spaces filled with a liquid, in which the nerves and vessels were freely suspended. Pacini, and after him Remak and Kölliker, perceived that in each of these supposed spaces the nerves form a delicate network applied against the lower surface of each of the solid partitions (*electrical plates* of Schultze). This arrangement is confirmed by Schultze, who says that the nerves

always adhere to the ventral surface of the electrical plate, whilst the dorsal surface is completely free. The nervous network of the inferior surface forms a very elegant system of regular meshes, which agrees perfectly with the figure given of it by M. Kölliker, and which appears to be intimately united with the substance of the electrical plate. These meshes are of extreme fineness, and can only be distinguished by means of a high magnifying power. The electrical plate itself (*septum* of authors) is a perfectly transparent homogeneous plate; its thickness is only 0.001 to 0.002 line, and it presents here and there a few scattered nuclei. It is hardly possible to give a positive proof of the continuity of tissue which M. Schultze assumes to exist between this plate and the minute ramifications of the nervous network, for the latter is of extreme tenuity. However, it is impossible to separate the nervous network as a continuous layer from the plate. The author depends principally upon chemical considerations in claiming for these plates the part of electrical plates. In fact, they are not formed of conjunctive tissue, but are of an albuminous nature. Under the action of a solution of sugar and sulphuric acid, they acquire a rose-colour, like the electrical plates of other electrical fishes. Ebullition in water, which dissolves the conjunctive tissue of the longitudinal walls of the prisms and the transverse gelatinous septa, separates the plates from each other. These facts are sufficient to show that Kölliker was wrong in considering these plates as of the nature of conjunctive tissue.

Relying on the preceding investigations of R. Wagner and Pacini, without having examined the Torpedo for himself, Bilharz thought that the homogeneous membranes with scattered nuclei, of these fishes, might be compared with the electrical plates of *Malapterurus*. This assimilation now appears to be well founded. Schultze, like Leydig, certainly shows that not only nuclei but also true cells with a very transparent membrane are found here and there in the homogeneous plates of the Torpedos, while nuclei alone are met with in the electrical plates of *Gymnotus* and *Malapterurus*. But this difference is evidently of no importance. The author thinks, moreover, that these nuclei and cells are of purely embryonal signification, inasmuch as these elements would be destined to secrete the fundamental or essential substance of the plate in which the nervous fibrillæ terminate. In this point of view, the electrical plate would only be a kind of tubular development of the axial cylinder.

The investigations of M. Schultze furnish a new confirmation of the remarkable result previously enunciated by Kupffer and Keferstein, that, in all electrical fishes, that face of the electrical plate to which the nerves adhere is turned to the negative, and the free face to the positive side of the fish.

M. Schultze terminates his memoir with some profound chemical investigations upon the electrical organ of the Torpedos and the pseudo-electric organ of the Rays. Amongst the substances detected we shall indicate, especially, urea in very large quantities, syntonine, and a peculiar albuminous body.—*Abhandl. der naturforsch. Gesellsch. zu Halle*, 1859; *Bibl. de Genève*, 1859, *Bull. Scient.* p. 83.